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جائحة كوفيد 19 وأسواق الجملة للخضروات في مصر

منة الله ممدوح حسن محمد بدير العراقى أسماء عبدالفتاح أبوقمر
قسم الاقتصاد الزراعي – كلية الزراعة – جامعة عين شمس

المستخلص

يهدف هذا البحث الى تقييم الأثار قصيرة المدى لجائحة كوفيد 19 على سوق الجملة الرئيسى فى مصر و هو سوق العبور. و لتحقيق ذلك الهدف تم اجراء تحليل فرق الفروق للاسعار والكميات اليومية لثلاثة خضروات رئيسية هى الطماطم و البطاطس و البصل. يوضح البحث أن الكميات الواردة لسوق العبورمن تلك المحاصيل لم تتاثر معنويا بالقيود التى فرضتها الجائحة بينما انخفضت أسعار الجملة اليومية بمعدلات معنوية احصائيا بلغت نحو 15.9% للطماطم و نحو 17.2% للبطاطس. و قد يعزى الانخفاض فى أسعار تلك المحاصيل الى انكماش طلب المستهلك نظرا للخوف من الاختلاط فى الاسواق و للقيود التى فرضت على التنقل و على المطاعم و محلات التجزئة. أما سعر البصل فلم يتأثر معنويا ربما لامكانية تخزينة لفترات طويلة نسبيا و كذلك للاعتقاد السائد بفوائد البصل المتوقعة على جهاز المناعة.

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COVID-19 Pandemic and Vegetable Wholesale Markets in Egypt

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ABSTRACT

The purpose of this paper is to assess the short-run effects of COVID-19 restrictions on the main wholesale market for fresh produce in Egypt. The difference-in-differences analysis is carried out for the daily wholesale prices and quantities of three main vegetables; namely tomatoes, potatoes and onions. The analysis shows that the supplied quantities of the three vegetables were not significantly affected by the pandemic restrictions. Seemingly, the lockdown did not have any significant effect on the transportation capacity of vegetables from the farm to the wholesale market. And the farming activities were not seriously affected by coronavirus in Egypt. Farming business continued as usual and there was no interruption of the supply of labor and other inputs.

However, the wholesale prices of tomatoes and potatoes have decreased significantly by 15.9 % and 17.2 % respectively because of the COVID-19 lockdown. These drops in prices are a reflection of the lost consumer demand because of the coronavirus pandemic. The wholesale price of onions was not significantly affected by the pandemic probably because of its perceived benefits to the immune system by ordinary consumers in times of viral infections.

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Introduction:

The spread of coronavirus all over the world starting from early 2020 led to severe effects on most societies, not only regarding the health and wellbeing of people but also regarding socioeconomic conditions. The most notable measures taken by various countries to combat the virus included social distancing, restricted movement of people, closure of businesses, suspension of transportation services, and different variations of lockdown in certain regions and countries. Some industries like tourism and aviation came to near complete shutdown. Businesses in the food sectors suffered from disruption of supply chains and from the temporary closure of restaurants and some food processing plants. The fear of the likelihood of empty shelves and the uncertainty regarding movement restrictions led to temporary panic shopping and hoarding behavior.

This paper is an attempt to examine the short –run effects of coronavirus on Egyptian wholesale fresh produce markets with special reference to El-Obour market. El-Obour market is the main wholesale market for fruits and vegetables in Greater Cairo. A review of recent literature related to COVID-19 and its effects on food markets is presented in the following section. Subsequently the main measures taken by the Egyptian government to combat the virus are highlighted. Then the data requirements and data sources are

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discussed. The remaining sections present the methodology and the results of econometric analysis. The last section presents the main conclusions and recommendations.

Literature Review:

Recent literature attempted to quantify the effects of the COVID-19 pandemic on different aspects of the food system. For example, Dietrich et al., (2020) examined the effects of coronavirus on local food prices in 44 low and middle-income countries. COVID-19 short-run effects on the wholesale prices of fruits and vegetables in the U.S. and China were analyzed by Çakır et al., (2020). The implications of COVID-19 for the supply chains of fruits and vegetables are outlined in FAO (2020) and Chenarides et al., (2021). Mahajan and Tomar (2021) analyzed the possible effects of COVID-19 on food markets in India. Implications of COVID-19 on food security In Ethiopia are spelled out in Hirvonen et al., (2021). The effects of COVID-19 on the wholesale prices of cabbage in China were analyzed by Ruan et al., (2021).

The potential effects of COVID-19 on food waste were addressed by Roe et al., (2021). Zeballos and Dong (2021) analyzed the effects of COVID-19 on food sales in the U.S. Ridley and Devadoss (2021) showed that COVID-19 has had great effects on the production of labor-intensive commodities like fruits and vegetables in the U.S. because of its effects on the labor supply. The potential effects of COVID-19 on jobs and households in Egypt were discussed in Breisinger et al., (2020).

Egypt Response:

The first confirmed cases of coronavirus infection among foreign tourists were declared in February 2020 in Egypt. The government started taking measures to combat the virus and to limit its spread in the country soon after. Restrictions on social gatherings and mandatory masking were implemented. Air flights to and from countries with a high incidence of infections were suspended. Schools, universities, sports clubs and places of worship were shut down as well. Several government services such as civil registry services, work permits, passports and renewal of traffic licenses, were all suspended. Then on March 24, 2020 the government announced a policy of partial lockdown starting from the following day. The lockdown entailed night curfew from 7 pm to 6 am for 15 days. The lockdown was further extended several times afterwards with minor modifications until June 27, 2020.

The partial lockdown was lifted starting from June 28 but the precautionary measures of social distancing continued long after that date. The curfew was applicable to all methods of transportation and vehicles. All public and private mass transportation means stopped from 7 pm until 6 am. Commercial centers, such as malls, were restricted to working hours from 5 am to 6 pm. Dining in restaurants was prohibited but delivery service during the working hours was allowed provided that health precautionary measures were adhered to. Food service industries remained operational as 'take away' service until the start of the curfew hours.

Data:

Detailed data from El- Obour wholesale market in Egypt are utilized to investigate the effects of COVID-19 restrictions on fresh produce commodities in Egypt. El-Obour market is the main wholesale market for fruits and vegetables in Greater Cairo. The market serves retailers and ordinary consumers as well as large consumption entities like hotels, hospitals, and large supermarkets all over the country. The market receives produce from most production areas in the country, and is open for transactions 24 hours a day. The wholesale prices of fruits and vegetables are determined according to the supply and demand conditions in the market. The demand side of the market is represented by the retailers who in turn sell their produce to the final consumers. The wholesale prices in El-Obour market serve as reference prices for fruits and vegetables all over Egypt.

The data consist of average daily wholesale prices and quantities delivered to the market. The analysis is limited to three main vegetables, namely; tomatoes, potatoes, and onions. The data cover two periods; the first period is from January 1 to June 30, 2019 and marks the pre-pandemic period or the control group. The second period goes from January 1 to June 30, 2020 and it features the treatment group. The second

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period witnessed the spread of the coronavirus pandemic in Egypt and the subsequent implementation of social distancing and partial lockdown measures. The date of March 25 is the critical date here because partial lockdown started on that day. Therefore, the study compares between the average prices and quantities for the pre-lockdown period of January 1-March 24 and the post lockdown period of March 25-June 30. Tables 1 and 2 present the descriptive statistics of the delivered quantities to El-Obour market and the wholesale prices of the three vegetables respectively.

Table (1) illustrates that the average daily quantities delivered to El-Obour market show small variation for the period 1 January: 24 March between 2019 and 2020. For example, the average daily quantity of potatoes fell from 628 tons during January 1- March 24, 2019 to 583.9 tons during the same period in 2020. This is equivalent to a 7 % decline in the quantity supplied. Similarly, the average daily quantity of onions decreased from 571.4 tons in the same period of 2019 to 563.6 tons in the same period of 2020.

Accordingly, the study conjectures that the market conditions during the pre-pandemic period were pretty much similar for 1 January: 24 March period in both years. The data in the last 2 columns of table (1) show small changes for the entire period from January 1 to June 30 between 2019 and 2020. For example, the average daily quantity of tomatoes delivered to the wholesale market during the first six months of 2019 is 631.6 tons while that for 2020 is 615 tons. The delivered quantities of the three vegetables to El-Obour market have increased between the two periods of January 1: March 24 and March 25: June 30 for both years. And the variability of the supplied quantities was more evident for the post lockdown period than that for the pre-lockdown period as indicated by the standard deviation statistics.

Table 1: Descriptive Statistics of Daily Vegetable Quantities, Tons.

	Jan 1: Mar 24		Mar 25: Jun 30		Jan 1: Jun 30	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
2019:						
Tomatoes	567.2	85.4	687.9	208.8	631.6	173.7
Potatoes	628	123.7	765.3	289.1	701.3	237
Onions	571.4	91.9	796.8	332	691.7	274.1
2020:						
Tomatoes	537.6	146.3	681.1	175.6	615	177
Potatoes	583.9	175.7	735	214	665.5	211.3
Onions	563.6	154.8	719.2	207.7	647.6	200.4

Source: El-Obour market database.

The graphical analysis of vegetable wholesale markets would shed more light on the effects of COVID-19. Here we study the case of potatoes as an example of an important vegetable in the daily diet of Egyptian families. Figure (1) shows the movements of the daily wholesale quantities of potatoes for the entire period January 1 to June 30 for 2019 and 2020. The vertical line in the middle of the graph marks the end of the 2019 period and the start of the 2020 period. The other two vertical lines mark the lockdown date of 25 March in both years. The graph does not reveal any significant changes in the pattern of potato quantities between 2019 and 2020. However, the regions of B and D show more spikes in the supplied potato quantities during the period of March 25: June 30 for both years. That is there was more variability in the supplied quantities after March 25 than before March 25 for both years as confirmed by the standard deviation statistics in table 1.

The summary statistics of the wholesale vegetable prices are presented in table (2). The prices of tomatoes and onions show little change between 2019 and 2020 for the period January 1: March 24. The average daily wholesale price of tomatoes fell by 4 % between 2019 and 2020, while the average price of onions has almost stayed the same for both years. The price of potatoes showed the largest change between 2019

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and 2020 for the pre- lockdown period of January 1: March 24. It decreased by 36.3 % between 2019 and 2020.

The average prices for the post-lockdown period show more changes between 2019 and 2020. For example, the average price of potatoes fell from L.E. 4.23 per kilogram in the period of March 25: June 30, 2019 to L.E. 2.2/kg during the same period in 2020. That is, the price fell by 48 % between the two years. The changes for the entire period of January 1: June 30 are shown in the last two columns of table (2). For onions, the average wholesale price fell from L.E.4.03/kg during the first six months of 2019 to about L.E.2.26/kg for the same period in 2020. In general, the wholesale prices of vegetables showed more variations between 2019 and 2020 compared to the variations in the quantities delivered to the wholesale market.

Figure 1: Daily Potato Quantity

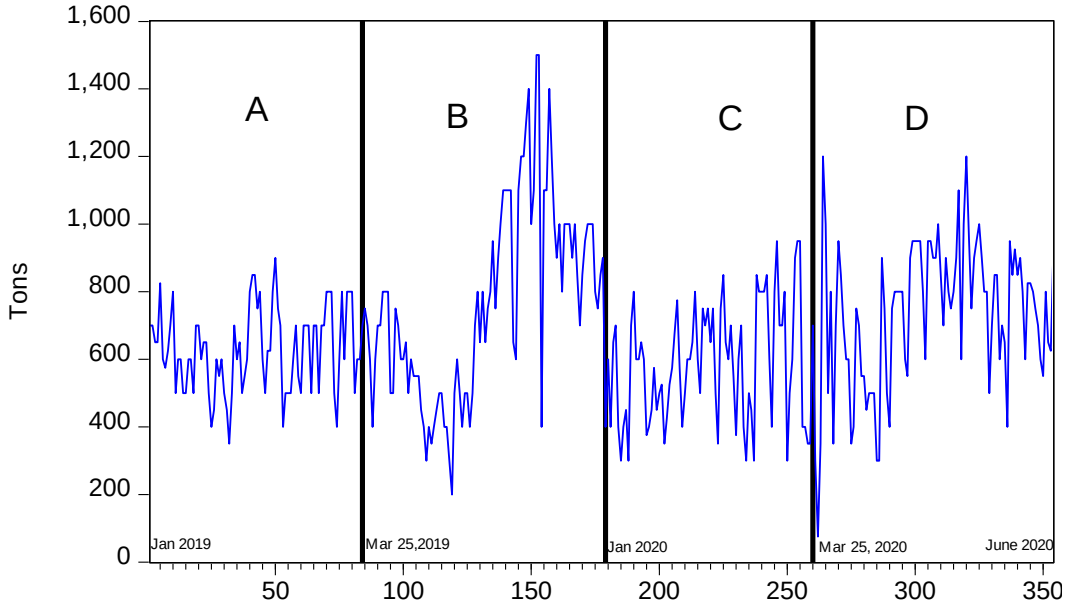

Table 2: Descriptive Statistics of Average Daily Wholesale Prices, L.E. /KG

	Jan 1: Mar 24		Mar 25: Jun 30		Jan 1: Jun 30	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
2019:						
Tomatoes	3.32	0.34	3.55	0.62	3.44	0.52
Potatoes	4.68	0.48	4.23	0.74	4.44	0.67
Onions	4.4	0.37	3.7	1.01	4.03	0.86
2020:						
Tomatoes	3.19	0.32	2.93	0.41	3.04	0.42
Potatoes	2.98	0.68	2.2	0.2	2.56	0.62
Onions	4.43	0.49	4.1	1.28	2.26	1.01

Source: El-Obour market database.

Figure (2) shows the pattern of daily wholesale price movements for potatoes in El-Obour market for the first six months of 2019 and 2020. The potato prices tended to increase during the period January 1: March 24, 2019. Then the potato prices declined sharply during the period March 25: June 30, 2019. Region C depicts the movement of wholesale potato prices during the period January 1 to March 25, 2020. Obviously, the potato prices witnessed a downward trend with the occurrence of COVID-19 in early 2020 when several countries started imposing restrictions on potato imports in order to contain the spread of the virus. After March 25, 2020 the prices of potatoes began to stabilize at the low levels of the previous period. That is,

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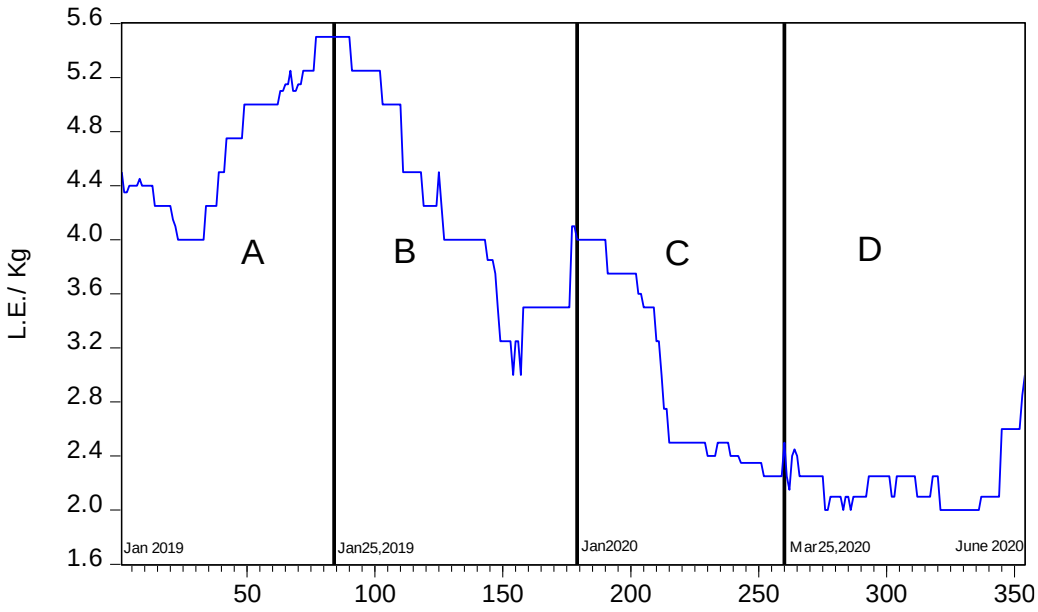
the wholesale prices of potatoes showed a clear downward trend after March 25, 2019. But the trend of falling wholesale prices of potatoes was less evident after 25 March, 2020 than before.

Figure 2: Daily Wholesale Potato Prices



Methodology:

The coronavirus pandemic and the subsequent measures to combat its spread have affected the fresh produce markets in several ways. On the supply side, restrictions on transportation and the mobility of people have affected the availability of necessary inputs and labor required for food production. And the disruption of the transportation services have obstructed the movement of commodities from farms and processing facilities to markets. On the demand side, the closure of restaurants, hotels, schools and other food service centers have negatively affected the demand for food. Particularly, the restrictions imposed on the working hours of malls and supermarkets have affected access to food markets. Furthermore, the rise in unemployment and lost income might have caused a decline in the demand for food. In addition, consumers have apparently adjusted their shopping behavior because of the fear of transmitting and contracting the virus. Consumers tend to shop less frequently than before the outbreak of the virus.

To estimate the effect of COVID-19 lockdown on the vegetable wholesale markets we resort to a technique known as difference-in-differences regression that is commonly used in impact studies, see for example Gertler et al., (2016). The difference-in differences calculations could be done in a neat way by means of regression analysis; see for example, Hill et al., (2011). The advantage of regression analysis is the ability to add more controls in order to isolate the effects of other factors that might affect the outcome variable. The analysis of the effect of COVID-19 lockdown on the wholesale markets of fresh vegetables is based on the following econometric model:

$$\text{Ln } y_t = \beta_0+\beta_1 After_t+\beta_2 Treat_t+\beta_3 Treat_t*After_t+\beta_4 Time_t+\beta_5 Ramadan_t+\varepsilon_t$$

Where: Ln y is the natural logarithm of the outcome variable. The outcome variable could be the daily wholesale price or the daily quantity of fresh produce delivered to El-Obour market. Treat is a dummy variable that takes the value of 1 for the period January 1 to June 30, 2020. Otherwise the value of treat is zero for the same period in the comparison year of 2019. The after variable takes the value of 1 for the period from 25 March to 30 June in both years and the value of zero otherwise. Here, like in other studies of COVID-19, the distinction between treatment and comparison groups is based on a temporal dimension; see for example Fang et al.,(2020) and Çakır et al., (2020).

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The dummy variable of Ramadan is included in order to control for the fixed effects of the festive environment and increased demand for group dining during the month of Ramadan. The Ramadan variable takes the value of 1 during the period of May 6 to June 3, 2019 and April 24 to May 23, 2020. Otherwise, the value of Ramadan is zero. Some studies argue that food consumption increases during the month of Ramadan, see for example Barakat et al., (2020). In order to control for possible seasonal changes and for non-stationarity in the time series we include the time trend variable. The error term is represented by ε_t.

The coefficient of the interaction variable Treat* After is of especial interest in this study because it shows what is known as the average treatment effect (ATE) of COVID-19 lockdown on the outcome variables. That is the estimate of β_3 is the average estimated effect of the COVID-19 partial lockdown on the wholesale vegetable quantity or wholesale price during the period from March 25 to June 30, 2020. Angrist and Pischke (2008) provide different concepts of treatment effects including ATE.

Results and Discussion:

Three models are estimated for every outcome variable for every vegetable. Model (1) does not include any fixed effects. Model (2) includes the fixed effects of the fasting month of Ramadan only. Model (3) includes the fixed effects of Ramadan and the time trend variable. The results for the wholesale prices are presented in table (3) while the results for the vegetable quantities are presented in table (4).

Tomatoes

As table (3) indicates the results for the price of tomatoes are statistically significant for all coefficients. The coefficient of interest here is the coefficient of the interaction between treat and after variables. The estimates of this coefficient vary from -0.155 for model 1 to – 0.159 in model 3. That means that the average treatment effect of the COVID-19 lockdown is about 15.7 percent decrease in the wholesale price of tomatoes. The p-value for this estimate shows that it is statistically significant at the 1 % level. All coefficients of the price equation in the full model, model 3, are statistically significant at the 1 % level. Moving from model 1 to model 3 improves the value of R-squared from 0.200 to 0.401. Table (4) shows that the short-run effect of the COVID-19 lockdown on the daily quantity of tomatoes is an increase of about 7 %. This 7 % increase is almost constant for the three models and is statistically insignificant in all models as well.

In other words, the lockdown did not have any significant effect on the transportation capacity of tomatoes from the farm to the wholesale market. Therefore the supply of tomatoes to the wholesale market was not significantly affected by the COVID-19 pandemic. Apparently the farming activities and farm production were not seriously affected by coronavirus in Egypt. Farming business continued as usual and there was no interruption of the supply of labor and other inputs. Breisinger et al., (2020) argue that the agriculture sector was the most resilient sector in the face of coronavirus in Egypt.

The decline in the wholesale price of tomatoes in spite of the unaffected supply could be due to the effects of the coronavirus on the demand for tomatoes. People started going to the market less frequently after the outbreak of the virus than before and their demand for fresh produce decreased as a result. Shopping less frequently and the inability to store large quantities of perishable produce like tomatoes resulted in a large drop in consumer demand and a subsequent decline in the retailers demand for fresh produce. The closure of restaurants, universities and clubs contributed to the decline of demand for fresh produce. This situation could be explained with the help of figure (3). The equilibrium wholesale price decreased from P_0 to P_1 as a result of the shift in the demand curve to the left from D_0 to D_1. Basically the supply curve was not affected by coronavirus and stayed at S_0. But the demand curve for retailers shifted downward from D_0 to D_1 because of the restrictions imposed by the government to combat the coronavirus. Therefore the equilibrium wholesale price decreased from P_0 to P_1.

Potatoes:

The results of model 3 in table (3) reveal that the average treatment effect of COVID-19 on the wholesale price of potatoes is -0.172 which is statistically significant at the level of 5 %. This result is almost the same

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for the other two models. Therefore, we conjecture that the wholesale price of potatoes declined by 17.2 % as a result of COVID-19 pandemic. The effect of COVID-19 on the quantity of potatoes delivered to the wholesale market is an increase of 7.9 %. This rate of increase, however, is statistically insignificant. That means that the farm-wholesale market chain has hardly been affected by the coronavirus pandemic. Transportation of the potato crop could have been intensified during the day hours to make up for the lost night hours during the curfew.

On the demand side consumers have been shopping less frequently after the outbreak and the overall consumer demand for potatoes has declined because of the closure of food services outlets and other restrictions. The loss in consumer demand led to a decrease in the retailers demand for potatoes in the wholesale market. Therefore, the wholesale price of potatoes has declined by about 17.2 %. This situation is similar to the case of tomatoes and is depicted in figure (3). The supply curve for potatoes stayed at S_0 while the demand curve shifted inward from D_0 to D_1.

Onions

Model 3 shows that the average wholesale price of onions in El- Obour market has slightly increased by 8.4 % due to COVID-19. However, this rate of increase is statistically insignificant at conventional levels of significance. The results of the other two models are quite similar to those of model 3. With regards to the quantity of onions, model 3 shows that COVID-19 has caused a drop of the supplied quantity by 2.7 %. This rate of decline is negligible and statistically insignificant.

In short, COVID-19 has had no apparent effect on the wholesale market of onions. Like tomatoes and potatoes, the delivered quantity of onions to El-Obour market was not affected by COVID-19. But unlike tomatoes and potatoes, the demand for onions was not affected by the coronavirus as well. That is why the pandemic had no effect on the wholesale price of onions.

Unlike other vegetables, onions could be stored for longer periods without refrigeration. So it is possible to buy large quantities of onions in every shopping trip and store at home for future consumption. In fact, onions are perceived as a booster of the immune system and as such coronavirus could have enhanced the consumer demand for onions. At least the drop of demand because of the COVID-19 environment could have been balanced out by the potential increase in the demand for onions because of its perceived benefits to the immune system. In other words, the demand and supply curves of onions have apparently stayed at the initial levels that prevailed before the pandemic.

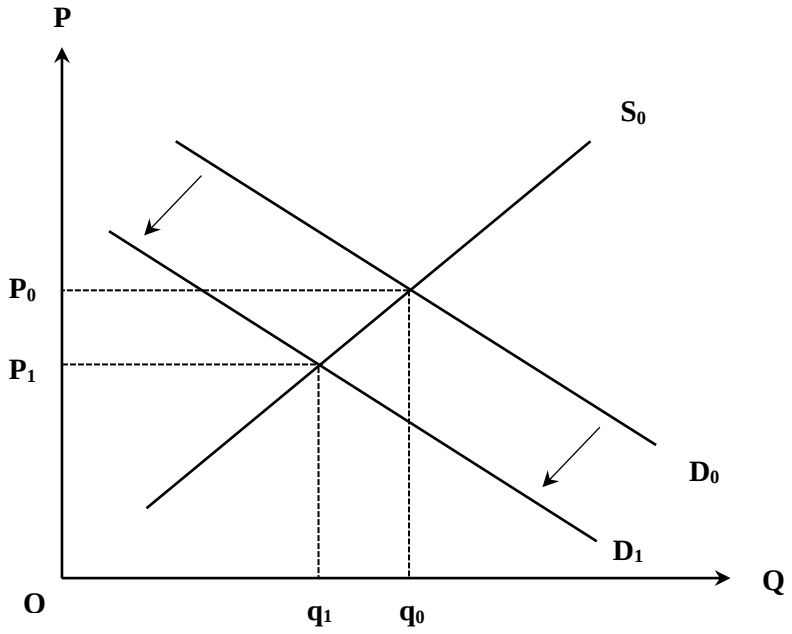

Figure (3): Vegetable Wholesale Market

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Fixed Effects of Ramadan:

Another effect of special interest is that of the month of Ramadan. The results of model 3, table 3, indicate that the average wholesale price of tomatoes increases by about 14.6 % during Ramadan. At the same time, the quantity supplied to the wholesale market increased by 17 %, table 4, in order to meet the increasing demand for tomatoes in Ramadan. Previous studies show that the demand for food increases during the month of Ramadan compared to the rest of the year. The effect of Ramadan on the price and quantity is statistically significant at the level of 1 %. Under normal circumstances people tend to increase their social interactions and group dining while celebrating the holy month of Ramadan.

The effect of Ramadan on the wholesale price of potatoes is statistically significant in models 2 and 3. With regards to the quantity of potatoes, the coefficient of Ramadan is positive and statistically significant at the level of 1 % in both models. That means the supplied quantity of potatoes to the wholesale market tend to increase by about 26-27 % during the month of Ramadan to meet the growing consumer demand. Similarly, the effect of Ramadan on the supply of onions is statistically significant at the 1 percent level of significance. The Ramadan- induced increase of the supply of onions in the wholesale market was about 25.6 % to 27.5 %. In spite of the hike of onions supply in the month of Ramadan, the wholesale price of onions was not affected probably due to a parallel increase in the demand of onions

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Table 3: Difference-in-Differences Regression Results, Wholesale Prices

Log Wholesale Price			
Variables	Model (1)	Model (2)	Model (3)
	Tomatoes		
Constant	1.193^{***} (0.027)	1.193^{***} (0.027)	1.286^{***} (0.029)
Treat	-0.039 (0.036)	-0.039 (0.036)	0.354^{***} (0.085)
After	0.058 (0.050)	0.017 (0.048)	0.213^{***} (0.046)
Treat*After	-0.155^{***} (0.059)	-0.157^{***} (0.054)	-0.159^{***} (0.046)
Ramadan	---	0.138^{***} (0.039)	0.146^{***} (0.039)
Time	---	---	-0.002^{***} (0.0005)
R-Squared	0.200	0.279	0.401
	Potatoes		
Constant	1.538^{***} (0.027)	1.538^{***} (0.027)	1.644^{***} (0.050)
Treat	-0.472^{***} (0.065)	-0.472^{***} (0.065)	-0.022 (0.157)
After	-0.110^{**} (0.049)	-0.092^{*} (0.053)	0.132 (0.085)
Treat*After	-0.170^{**} (0.079)	-0.169^{**} (0.078)	-0.172^{**} (0.071)
Ramadan	---	-0.062^{*} (0.035)	-0.052^{*} (0.029)
Time	---	---	-0.003^{***} (0.0008)
R-Squared	0.794	0.798	0.835
	Onions		
Constant	1.479^{***} (0.020)	1.479^{***} (0.020)	1.685^{***} (0.053)
Treat	0.005 (0.032)	0.005 (0.032)	0.874^{***} (0.178)
After	-0.206^{***} (0.069)	-0.165^{**} (0.072)	0.267^{**} (0.105)
Treat*After	0.088 (0.105)	0.089 (0.103)	0.084 (0.088)
Ramadan	---	-0.141 (0.094)	-0.123^{*} (0.067)
Time	---	---	-0.005^{***} (0.001)
R-Squared	0.134	0.173	0.451

Note: Robust standard errors are in parentheses. The standard errors are HAC and computed using a Bartlett kernel, a Newey-West fixed bandwith of 6, and a degrees – of – freedom adjustment. The number of observations is 354 in all equations.

*** P < 0.01, ** P < 0.05, * P < 0.

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Table 4: Difference-in-Differences Regression Results, Wholesale Quantities

Log Wholesale Quantity			
Variables	Model (1)	Model (2)	Model (3)
	Tomatoes		
Constant	6.329^{***} (0.021)	6.329^{***} (0.021)	6.157^{***} (0.041)
Treat	-0.081^{*} (0.043)	-0.081^{*} (0.043)	-0.803^{***} (0.139)
After	0.152^{**} (0.074)	0.097 (0.081)	-0.261^{**} (0.106)
Treat*After	0.075 (0.095)	0.073 0.090	0.078 (0.075)
Ramadan	---	0.185^{***} (0.067)	0.170^{***} (0.053)
Time	---	---	0.004^{***} (0.001)
R-Squared	0.098	0.137	0.249
	Potatoes		
Constant	6.423^{***} (0.029)	6.423^{***} (0.029)	6.230^{***} (0.053)
Treat	-0.101^{*} (0.052)	-0.101^{*} (0.052)	-0.912^{***} (0.152)
After	0.142 (0.092)	0.061 (0.092)	-0.342^{***} (0.114)
Treat*After	0.078 (0.114)	0.075 (0.105)	0.079 (0.089)
Ramadan	---	0.275^{***} (0.081)	0.258^{***} (0.065)
Time	---	---	0.005^{***} (0.001)
R-Squared	0.074	0.142	0.253
	Onions		
Constant	6.335^{***} (0.024)	6.335^{***} (0.024)	6.124^{***} (0.046)
Treat	-0.041 (0.045)	-0.041 (0.045)	-0.928^{***} (0.150)
After	0.257^{***} (0.096)	0.176^{*} (0.096)	-0.265^{**} (0.114)
Treat*After	-0.030 (0.117)	-0.033 (0.108)	-0.028 (0.090)
Ramadan	---	0.275^{***} (0.090)	0.256^{***} (0.071)
Time	---	---	0.005^{***} (0.001)
R-Squared	0.118	0.183	0.311

Note: Robust standard errors are in parentheses. The standard errors are HAC and computed using a Bartlett kernel, a Newey-West fixed bandwith of 6, and a degrees – of – freedom adjustment. The number of observations is 354 in all equations.
*** P < 0.01, ** P < 0.05, * P < 0.1

Summary and Conclusions:

The analysis of difference –in-differences regressions reveals that the COVID-19 partial lockdown had no statistically significant effects on the vegetable quantities supplied to the main wholesale market in Egypt. This could be because of the nature of the lockdown which was applicable only during the night hours. And it could also be attributable to the short supply chain between the farm and the wholesale market. Basically, once the vegetable is harvested it moves right away to the wholesale market via unrefrigerated trucks. The

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transportation services might have been intensified during the day hours to make up for the lost night hours during the curfew. The unaffected supply of vegetables reflects also the fact that farm production was not influenced by the virus because the flow of farm inputs and labor continued without disruption.

But COVID-19 had its significant short-run effects on the demand side of vegetable markets. On the demand side, the closure of restaurants, hotels, schools and other food service centers have negatively affected the demand for food. Particularly, the restrictions imposed on the working hours of malls and supermarkets have affected access to food markets. Furthermore, the rise in unemployment and lost income could have caused a decline in the demand for food. In addition, the fears of transmitting and contracting the coronavirus have prohibited people from practicing their normal shopping routines.

The shrinking consumer demand for fresh vegetables was translated to a shrinking demand by retailers in the wholesale market. That is why the wholesale prices were negatively affected by the COVID-19 lockdown. The lockdown caused the wholesale prices of tomatoes and potatoes to decrease by 15.7 % and 17.2 % respectively. These drops in prices are statistically significant at 1 % level of significance. The wholesale price of onions has slightly increased but at a statistically insignificant rate. In other words, unlike tomatoes and potatoes, the wholesale price of onions was not affected by the lockdown in the short-run. Onions could be stored for longer periods without refrigeration and it would be possible for shoppers to buy larger quantities in a single trip and store for future consumption. Besides, onions are perceived by ordinary consumers as a booster for the immune system especially in times of pandemics. Therefore, it is possible that the perceived benefits of onions may have contributed to demand gains which could have balanced out the lost demand because of the lockdown restrictions. The research points to the importance of studying the effects of potential pandemics on agricultural markets in order to help design appropriate policies for maintaining resilient food systems. It is recommended that resources should be made available to build reliable databases for other wholesale markets like Al-Nozha and 6 of October markets. Similar analyses could be done on the other wholesale markets when data becomes readily available.

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